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(54) SPUTTERING TARGET MATERIAL

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a sputtering target material composed of Ag alloy and having high reflectivity and excellent sulfidation resistance.
SOLUTION: The sputtering target material is composed of the Ag alloy which is prepared by adding specific small amounts of metal component (A) selected from Ge, Ga and Sb, specific small amounts of metal component (B) selected from Au, Pd and Pt, and, if necessary, a small amounts of Cu to Ag and carrying out alloying.

* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1]At least one sort of metallic components (A) 0.1 - 4.9mass% and Au which are chosen as Ag from germanium, Ga, and Sb, At least one sort of metallic components (B) 0.1 chosen from Pd and Pt - 4.9mass% are added, A sputtering target material for high-corrosion-resistance thin film forming which has high reflectance, wherein a sum total addition of a metallic component (A) and a metallic component (B) comprises an Ag alloy which is 0.2 - 5mass%.
[Claim 2]At least one sort of metallic components (A) 0.05 - 4.85mass% and Au which are chosen as Ag from germanium, Ga, and Sb, At least one sort of metallic components (B) 0.1 - 4.9mass%, and Cu 0.05 - 4.85mass% chosen from Pd and Pt is added, A sputtering target material for high-corrosion-resistance thin film forming which has high reflectance, wherein a sum total addition of a metallic component (A), a metallic component (B), and Cu comprises an Ag alloy which is 0.2 - 5mass%.
[Claim 3]A high-corrosion-resistance thin film which has the high reflectance formed using the sputtering target material according to claim 1.
[Claim 4]A high-corrosion-resistance thin film which has the high reflectance formed using the sputtering target material according to claim 2.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to corrosion resistance, the sputtering target material for thin film forming which raised halogen-proof nature, oxidation resistance, and sulfuration-proof nature especially, and the thin film formed using this sputtering target material, maintaining high reflectance.
[0002]
[Description of the Prior Art]The reflection film currently used for optical recording media, such as CD (Compact Disc) and DVD (Digital Versatile Disc), Generally aluminum and an aluminum alloy are used for the light reflex nature conducting film currently used for displays, such as a reflection type STN (Super Twist Nematic) liquid crystal display and an organic electroluminescence (Electro luminescence) display.
[0003]The light reflex nature thin film used for the use of the above-mentioned optical recording medium, a liquid crystal display, an organic electroluminescence display, etc., etc., The sputtering target material which generally has the character considered as a request is produced, and it is manufactured by forming membranes using the sputtering target material by RF (high frequency) sputtering process or DC (direct current) sputtering process.
[0004]The thin film which consists of aluminum manufactured by the above-mentioned method or an aluminum alloy has a certain amount of reflectance, and its electrical resistance is low, moreover, it has the corrosion resistance stable in the air in order to form a passive film in a surface, but The reflectance of the thin film which consists of aluminum or an aluminum alloy is about 80%, when it is the light whose wavelength is 700 nm, for example.
To the use as which high reflectance is required, it cannot fully be satisfied.

[0005]Therefore, the thin film which has high reflectance is required, for example, forming a thin film in aluminum or an aluminum alloy instead as a sputtering target material using Au or Ag is proposed by the optical disk media represented by CD-R and DVD.
Using Ag with high reflectance as a thin film material is proposed also about the reflection type STN LCD display.

[0006]However, Au is expensive and, as for Ag, there is a problem in corrosion resistance especially halogen-proof nature (Cl etc.), oxidation resistance, and sulfuration-proof nature as compared with aluminum. For example, if it will discolor and reflectance will fall, if Ag reacts to a halogen like Cl, and it reacts to sulfur or oxygen, the sulfide and oxide of Ag will be generated and black-ized and reflectance will fall.
[0007]Therefore, for example, to JP,7-3363,A. By adding and alloying a small amount of Mg to Ag, raising the corrosion resistance (halogen-proof nature, oxidation resistance, sulfuration-proof nature) of Ag is proposed again by adding and alloying a little Pd in a JP,2000-109943,A gazette at Ag.
[0008]However, sufficient corrosion resistance of Ag is not acquired by these Ag alloy-ization, either, or there are problems — corrosion resistance and although especially halogen-proof nature (Cl etc.) improves to some extent, seldom change to Ag about sulfuration-proof nature, and

sufficient corrosion resistance is not acquired.
[0009]The purpose of this invention is to provide the sputtering target material for thin film forming which consists of corrosion resistance and an Ag alloy in which halogen-proof nature, oxidation resistance, and sulfuration-proof nature have been improved especially, maintaining high reflectance.
[0010]
[Means for Solving the Problem]As a result of repeating examination wholeheartedly that this invention persons should attain the above-mentioned purpose, at least one sort of a small amount of germanium specific to this time and Ag, Ga, and Sb, If at least one sort of a little specific Au(s), Pd, and Pd is added and alloyed, Maintaining high reflectance which these both metallic components act synergistically and Ag has, corrosion resistance and an Ag alloy halogen-proof nature, oxidation resistance, and sulfuration-proof nature were markedly alike, and improved especially are obtained — when a little Cu(s) were added and alloyed further, it finds out corrosion resistance and that halogen-proof nature and sulfuration-proof nature improve further especially, and came to complete this invention.
[0011]At least one sort of metallic components (A) 0.1 – 4.9mass% and Au by which this invention is chosen in this way as Ag from germanium, Ga, and Sb, At least one sort of metallic components (B) 0.1 chosen from Pd and Pt – 4.9mass% are added, A sputtering target material for high-corrosion-resistance thin film forming which has high reflectance, wherein a sum total addition of a metallic component (A) and a metallic component (B) comprises an Ag alloy which is 0.2 – 5mass% is provided.
[0012]This invention At least one sort of metallic components (A) 0.05 – 4.85mass% and Au which are chosen as Ag from germanium, Ga, and Sb, At least one sort of metallic components (B) 0.1 – 4.9mass%, and Cu 0.05 – 4.85mass% chosen from Pd and Pt is added, A sputtering target material for high-corrosion-resistance thin film forming which has the high reflectance comprising an Ag alloy whose sum total addition of a metallic component (A), a metallic component (B), and Cu is 0.2 – 5mass% is provided.
[0013]Hereafter, it explains still in detail about this invention.
[0014]
[Embodiment of the Invention]The sputtering target material of this invention uses Ag as a base, and consists of the metallic component (A) chosen as this from germanium, Ga, and Sb, a metallic component (B) chosen from Au, Pd, and Pt, and an Ag alloy which adds Cu by a case further and is alloyed.
[0015]As the above-mentioned metallic component (A), germanium, Ga, and Sb can be used alone, respectively, or two sorts or three sorts may be used together. When not adding Cu, the addition of these metallic components (A), the sum total — 0.1 – 4.9mass% and the case where Cu is added preferably as for 0.3 – 3mass% of within the limits — the sum total — 0.1 – 4.85mass%, although it can be made desirable 0.3 – 3mass% of within the limits, It is preferred for Ga to use germanium at 0.1 – 2mass%, to use it at 0.1 – 1.5mass%, and to use especially Sb by 0.1 – 1.5mass% of within the limits.
[0016]Each of Au, Pd, and Pt can be alone used for the above-mentioned metallic component (B), or it may use together two sorts or three sorts. the addition of these metallic components (B) adds Cu — in spite of not carrying out — the sum total — 0.1 – 4.9mass% — it can be made desirable 0.5 – 3mass% of within the limits.
[0017]Although the relative proportion in particular of the metallic component (A) in an Ag alloy and a metallic component (B) is not restricted and can be arbitrarily changed by above-mentioned addition within the limits of each metallic component, Generally, within the limits of 1 / 2 – 2/1 especially 4 / 5 – 5/4 is suitable at the mass ratio of the metallic component (A) / metallic component (B).
[0018]furthermore — the case where the sum total addition of the metallic component (A) in an Ag alloy and a metallic component (B) does not add Cu — 0.2 – 5mass% — it can be made desirable 1 – 3mass% of within the limits.
[0019]on the other hand — Cu added if needed receives the sum total of a metallic component (A) and a metallic component (B) — 0.05 – 4.85mass% — it can be preferably used by 0.5 –

3mass% of within the limits. The sum total addition of the above-mentioned metallic component (A) in the Ag alloy in that case, a metallic component (B), and Cu 0.2 - 5mass%, Although it can be made desirable 0.5 - 3mass% of within the limits, and the relative proportion in particular of the metallic component (A) in an Ag alloy, a metallic component (B), and Cu is not restricted and it can change arbitrarily by above-mentioned addition within the limits of each metallic component, Generally a metallic component (A) and a metallic component (B), Within the limits of 1 / 2 - 2/1 especially 4 / 5 - 5/4 is suitable at the mass ratio of the metallic component (A) / metallic component (B), Cu is a mass ratio of Cu / metallic component (A) + (B), and within the limits of 1 / 5 - 3/2 especially 1 / 2 - 1/1 is suitable for it.

[0020]An Ag alloy can be manufactured by adding Cu in the above-mentioned quantity further to Ag by the above-mentioned metallic component (A), the metallic component (B), and a case, and, for example, fusing at about 1000 - the temperature of 1050 ** of abbreviation within suitable metal melting furnaces, such as a gas furnace and a high frequency fusion furnace. Although the atmosphere at the time of the dissolution is enough in the air, an inert gas atmosphere or a vacuum may be used if needed.

[0021]Although the metallic component (B), (Au, Pd, Pt), and Cu which are used can use what is marketed with gestalten, such as a grain, tabular, and massive, as a raw material, [Ag, a metallic component (A) (germanium, Ga, Sb),] Usually, purity is preferred for not less than 99.95% of especially thing not less than 99.9%.

[0022]In this way, the Ag alloy which contains a metallic component (A) and a metallic component (B) at an aforementioned rate in Ag, respectively is obtained. The sputtering target material which comprises this Ag alloy is maintaining the high reflectance which Ag originally has, and, moreover, its corrosion resistance, such as halogen-proof (especially Cl) nature, oxidation resistance, and sulfuration-proof nature, is improving far compared with conventional Ag-Mg alloy and Ag-Pd alloy.

[0023]Therefore, the sputtering target material which comprises an above-mentioned Ag alloy of this invention, It can be advantageously used as the object for the reflection films of the optical disk media represented by CD-R as which high reflectance is required, and DVD, and objects for light reflex nature thin films, such as a reflection type STN LCD display and an organic electroluminescence display.

[0024]Formation of the reflection film from the sputtering target material which comprises an Ag alloy of this invention can be performed with the sputtering process of itself known, for example, high frequency (RF) sputtering process, direct-current (DC) sputtering process, magnetron sputtering method, etc.

[0025]Hereafter, an example explains this invention still more concretely.

[0026]

[Example]the metallic component (A) (germanium.) of the quantity shown in the following table 1 at Examples 1-6 and the comparative example 1 - 7Ag Cu was added by a metallic component (B), (Au, Pd, Pt), and a case, after heating and fusing in temperature of about 1050 ** in a gas furnace, it cast in the mold, it was processed and the sputtering target material was produced. [Ga, Sb,]

[0027]

[Table 1]

表1

	試料No.	組成
実施例	1	Ag-1mass%Ga-0.7mass%Pd
	2	Ag-1mass%Ge-1mass%Au
	3	Ag-1mass%Sb-1mass%Au
	4	Ag-0.7mass%Ge-1mass%Au
	5	Ag-0.5mass%In-1mass%Au-0.5mass%Cu
	6	Ag-0.7mass%Ge-0.7mass%Pt
比較例	1	Ag-0.01mass%Sb-0.01mass%Au-0.1%Cu
	2	Ag-2mass%Ga-4mass%Pd
	3	Ag-1mass%Au
	4	Ag-1mass%Pd
	5	Ag-1mass%Sb
	6	Ag
	7	Ag-0.9mass%Pd-1mass%Cu

[0028]The thin film about 200 nm thick was made to form on a glass substrate by RF sputtering process using this sputtering target material.
[0029]The glass substrate to which the obtained thin film adhered was exposed into the atmosphere, and oxidation resistance was examined. Another glass substrate to which the thin film adhered was immersed into 10% salt (NaCl) solution and 0.01% sodium sulfide (Na_2S) solution, respectively, and halogen-proof (chlorine) nature and sulfuration-proof nature were examined. In each examination, viewing estimated the state of the thin film after predetermined time. A result is shown in the following table 2.
[0030]
[Table 2]

表2

		耐候性試験結果			耐硫化性試験結果		
		大気暴露試験(大気中放置)	浸漬試験(10%NaCl水溶液)		浸漬試験(0.01%Na2S水溶液)		
		暴露時間	浸漬時間		浸漬時間		
	試料No.	24Hr	10Hr	24Hr	3min	10min	30min
実施例	1	変化無	変化無	変化無	変化無	極薄茶色に変色	薄茶に変色
	2	変化無	変化無	変化無	変化無	極薄茶色に変色	薄茶に変色
	3	変化無	変化無	変化無	変化無	極薄茶色に変色	薄茶に変色
	4	変化無	変化無	変化無	変化無	極薄茶色に変色	薄茶に変色
	5	変化無	変化無	変化無	変化無	極薄茶色に変色	薄茶に変色
	6	変化無	変化無	変化無	変化無	極薄茶色に変色	薄茶に変色
比較例	1	薄茶に変色	黄色に変色	黄色に変色	茶色	黒紫色	黒紫色
	2	変化無	変化無	変化無	変化無	極薄茶色に変色	薄茶に変色
	3	変化無	変化無	変化無	極薄茶色に変色	茶色に変色	濃茶色に変色
	4	変化無	変化無	変化無	極薄茶色に変色	茶色に変色	濃茶色に変色
	5	薄茶に変色	茶色に変色	黄色に変色	変化無	極薄茶色に変色	薄茶に変色
	6	薄茶(一部に濃茶)に変色	茶色に変色	黄色に変色	茶色	黒紫色	黒紫色
	7	変化無	変化無	変化無	極薄茶色に変色	茶色に変色	濃茶色に変色

[0031]When the reflectance (vertical-incidence light) of the light in the 500-700-nm wavelength band of the thin film immediately after obtained production was measured, each reflectance of the thin film of Examples 1-6 was not less than 90%. On the other hand, the reflectance of the thin film of the comparative example 2 was 80 to 90%, and its reflectance was low.

[Translation done.]